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RESEARCH REPORT

IS THERE REGIONAL TAX COMPETITION IN BELGIUM ?

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Is there Regional Tax Competition in Belgium ?

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ABSTRACT

In this paper we study the determinants of Effective Corporate Tax Rates (ETR) of large Belgian firms. Our empirical model to explain firm level heterogeneity in ETRs, includes firm characteristics, sector membership, variables capturing legal tax breaks and location variables. Our results can be summarized as follows. First, we find the average Effective Tax Rate to be around 26% in the period 1993-2002, whereas the country wide Statutory Tax Rate (STR) in that period was 40.17 %. Second, we find that highly leveraged firms and R&D intensive firms have substantially lower Effective tax rates. Third, we observe substantial sector level heterogeneity in corporate tax burdens. Fourth, our findings are indicative of regional tax differences with a lower average ETR in Wallonia. And finally, we observe that firm level Effective Tax Rates have increased in recent years.

Keywords: Effective Tax Rates, Company accounts, Belgian firms

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Abstract (Nederlands)

In deze paper tonen we aan dat de *feitelijke* belastingdruk verschilt van de *officiële* belastingvoet voor wat betreft de vennootschapsbelasting. Waar de *officiële* aanslagvoet voor grote Belgische firma's, 40.17% bedroeg tot voor 2003, vinden we op basis van een steekproef van meer dan 12,000 firma's, dat de gemiddelde *feitelijke* belastingdruk gedurende die periode gelijk is aan 26%. Het verschil tussen die twee aanslagvoeten geeft weer in welke mate er sprake is van legale of onderhandelde tax faciliteiten voor individuele bedrijven. Terwijl de officiële aanslagvoet in 2002 verlaagd werd tot 33.99%, observeren we in de periode die voorafgaat (1993-2002) een gestadige stijging van de feitelijke belastingdruk op firma-niveau, met name in de laatste legislatuur (1999-2002). Hier kan sprake zijn van een anticipatie-effect waarbij de overheid ervoor gekozen heeft om de belastbare basis te vergroten in de periode die de daling van de officiële belastingvoet voorafging, zodat het effect op het budget min of meer neutraal zou blijven. Onze resultaten wijzen eveneens in de richting van een lagere gemiddelde belastingdruk voor firma's in Wallonië dan in Vlaanderen, wat kan wijzen op regionale tax concurrentie die vermoedelijk geïnspireerd is door de sterk verschillende economische situatie van beide regio's.

1. Introduction

Closer economic integration in the EU has increased capital mobility and is considered responsible for the greater tax competition between countries. It has been argued by some that this capital mobility will lead to a race to the bottom in corporate tax rates as countries compete with each other to attract firms (European Commission, 1998). To do so, governments have several tools at their disposal. They can either lower the statutory tax rate (STR), or they can narrow the tax base for all firms by making more expenses deductible which lowers profit and hence lowers the taxes due. However, governments may also target specific companies or sectors and offer them a preferential tax treatment or specific tax incentives (e.g., investment credits or tax holidays for foreign investors). Alternatively, they may also decide to alter the frequency and intensity of tax audits. More intensive tax auditing will make firms more cautious in declaring expenses which increases the tax base and raise the amount of taxes they pay. This would show up in the Effective Tax Rate (ETR) which as opposed to the Statutory Tax Rate (STR), also accounts for the tax base. As we will explain below, the difference between the STR and the ETR is a reflection of the number of tax facilities a country provides.

In this paper we analyze the determinants of firm level Effective tax rates (ETR) for large Belgian firms. While the Statutory tax rate is the same for all these firms, there is a lot of heterogeneity in Effective tax rates.[1] Our analysis indicates that while legal tax facilities explain some of the variation in Effective tax rates, a large part of the variation can be attributed to other more political factors, such as the size if a firm and the region it is located in. Sector membership and the political coalition of the federal government in office also turn out to be important factors in explaining the heterogeneity in ETRs. These more political factors could reflect either negotiated tax facilities or certain political and economical objectives that a government is aiming to achieve through its tax system.

We find an average ETR of about 26%, which is 14% lower than the STR of 40.17% in that same period. While the STR did not change in the period we analyze, we do observe yearly changes in average ETRs. Our results suggest that the average ETR has steadily increased in the course of the nineties. One potential explanation for this could

[1] A few other studies in have analyzed firm level ETRs using different data sets such as Buijink et al. (2002), Huizinga and Nicodème (2003).

be that the government anticipated the strong reduction in STR it carried through in December 2002.[2] By widening the tax base in the years before that reduction, the effect on the country's budget is more offset and the reduction of the STR does not have such a big impact on the budget as it otherwise may have had. Hence, our results of increasing ETRs, especially at the end of the nineties, may pick up an anticipatory effect of the decrease in the STR in 2002.[3]

Thus far the issue of regional tax competition within a country has not been studied in the literature before. Although it is clear that in many countries in Europe, regions within a country can differ substantially in terms of their economic development and attractiveness to firms. Belgium is a typical example of a country where the economic situation of its 3 regions is very different. While its 3 regions Flanders, Wallonia and Brussels are relatively autonomous politically, their fiscal policy is still very much a federal issue. However, with an average unemployment rate of about 8% in Flanders compared to about 14% in Wallonia, the demand for an autonomous fiscal policy is growing. In a wider European context, economists have been arguing that more peripheral countries like Greece and Portugal for example should be allowed to charge a lower corporate tax rate in order to differentiate themselves from the 'core' countries in Europe for the purpose of attracting firms within their country borders. This argument rests on the notion that firms in the core countries are more willing to pay higher taxes in return for better infrastructure, proximity to consumer markets, to suppliers and to other firms to benefit from agglomeration spillovers Baldwin & Krugman (2002) for example have shown that tax revenue over country GDP has not converged in Europe between the so called 'core' and 'periphery' countries.

In this paper we examine whether *within* a country like Belgium with large economic disparities between its regions,[4] there is any evidence of regional tax competition where

[2] Belgium recently lowered its STR from 40.17% to 33.9% from the year 2003 onwards. Many other EU countries have also lowered their STR. For example the STR of Italy was reduced from 52.20% in 1993 to 40.25% in 2002. For Denmark the STR decreased from 36% in 1993 to 30% in 2002 (KPMG, 2003).

[3] Devereux et al. (2002) also find that tax-cutting and base-broadening reforms usually go hand in hand leaving the effective tax rates fairly stable over time.

[4] There are many other countries in Europe that consist of regions with very different economic growth rates i.e. Italy, Germany and the UK amongst others.

the expectation would be that the more peripheral region of Wallonia would have a lower Effective tax rate than the 'core' region Flanders.

From a legal point of view, firms in Flanders, Wallonia and Brussels in principle are subject to the same STR and the same rules for the determination of the tax base apply. However, tax audits and controls are decentralized. Hence, one potential explanation for observing regional differences in ETRs could stem from the intensity of tax audits or controls which could be less strict in the Southern part of the country. Higher regional unemployment rate in Wallonia puts this region in a weaker bargaining position vis-à-vis foreign investors and domestic firms. This could result in a less stricter application of the rules by the controlling tax authorities, which may result in relatively lower effective tax rates for firms located in the Walloon region. Our empirical results indeed suggest lower ETRs in Wallonia, compared to Flanders after controlling for sectorial composition and firm characteristics.

The remainder of this paper is structured as follows: the next section gives an overview of related literature of the relevant legal and accounting aspects of Belgian corporate taxation. The collection and analysis of the data is discussed in Section 3. In section 4 we show some descriptive statistics. In section 5 we introduce the empirical model and in Section 6 we discuss the main results. Section 7 consists of some robustness checks. The last section concludes and summarizes the main results.

2. Legal Framework

In this section we explain how the determinants of the legal tax base and the legal tax facilities that applied in our period of investigation 1993-2002. The corporate income tax system in Belgium has a stepwise progressive tax rate system with rates ranging from 28% up to 40.17%.[5] All Belgian firms in our sample are large firms subject to the highest STR.

While we do not observe the tax base in our data, we do observe the yearly reported income/profits by each firm, which is taken by the tax authorities as the starting point for determining the tax base. The legal tax base is determined as follows. First, from the annual income/profit figures that firms report, the tax authority can reject a number of

[5] All the firms in our sample have reported income/profits over 89,500 € which makes them subject to the highest STR.

expenses, which are not deemed to be true expenses of the period. This would enlarge the tax base. Secondly, firms can get a tax facility for dividends received from affiliated firms in other European Union countries to avoid double taxation of dividend income.[6] Thirdly, they can get a tax break for losses reported in the past ('carry-forwards').[7] And finally, tax facilities are also granted for four types of investments: investments in patents, investments in Research & Development, investments in energy-saving technology and investments in the recycling of wrapping materials.[8] The extent to which expenses are rejected by the tax authority, as well some of the legal or negotiated tax facilities a company enjoys can not be observed in our data. However, we do know the total 'tax expenses' the firm owes to the tax authority. A generally accepted way of measuring the Effective tax rate (ETR) is by relating the firm level 'Tax expenses' to the 'reported profits (Buijinck et al 2002). The extent to which the ETR differs from the STR is indicative of how the tax base relates to the reported profits before taxes in our company accounts data. If the Effective rate lies below the Statutory rate, which on average is the case, the tax base is smaller than the reported earnings and the firm enjoys legal or negotiated tax facilities.

3. Data

We use a rich panel dataset of 12,197 large Belgian firms over a period of 9 years running from 1993-2002, which result in more than 100,000 observations. These data were obtained from a commercial database *BELFIRST* which contains the population of Belgian firms. We excluded very small firms because their legal public reporting requirement is lower and some variables required for our analysis were not reported by them. We did not include financial institutions like banks and insurance companies, because they are subject to a different set of accounting rules and reporting standards.

[6] When dividends come from associated firms within Europe, 95% of the dividend revenue is free of Belgian corporate tax. For revenues from affiliates outside the EU, no tax exemption is granted.

[7] The taxable income may be reduced with the losses of the previous periods. In Belgium only losses can be deducted from future profits, this is called carry-forward of losses (Vankerckhove and Heirewegh, 2003).

[8] For the period we analyse (1993-2002), the tax facility for each of these investments was 13.5% on the cost of the investment.

Our analysis is based on unconsolidated company accounts[9] and we only consider ETR observations between 0 and 1 to control for outliers as in Collins & Shackelford (2002). Our sample consists of firms in both manufacturing and non-manufacturing industries. The regional composition of our data is as follows: 22.5% of the firms in our sample are located in Brussels, 16% in Wallonia and 61% of the firms is located in Flanders. The regional composition of our sample reflects the regional composition of the population of firms making our sample truly representative.

While the BELFIRST data set contains data for the years 1989 to 2002, the availability varies between years. Especially, the availability of data for the years 1989-1992 is very limited. Therefore, we decided to focus on the period 1993-2002 for our analysis.

4. Descriptive Statistics

In the literature the Effective Tax Rate (ETR) is referred to as a micro backward-looking measure of corporate tax pressure (Devereux et al. 2002). This variable will be our dependent variable in the regression analysis in the next section. Table 1 presents some descriptive statistics (mean, median, standard deviation) for the ETR per region. A first observation is that while the ETR for large Belgian firms is 26%, the median ETR is somewhat higher and lies around 29%. A study of Buijink et al. (2002) finds an average ETR for Belgium of 21.64%, which is pretty similar to our findings. Second, while in principle all large Belgian firms are subject to the same Statutory tax rate, the standard errors in Table 1 indicate that there seems to be a lot of firm heterogeneity in ETRs.

Table 1: Average Effective Tax Rates by Region

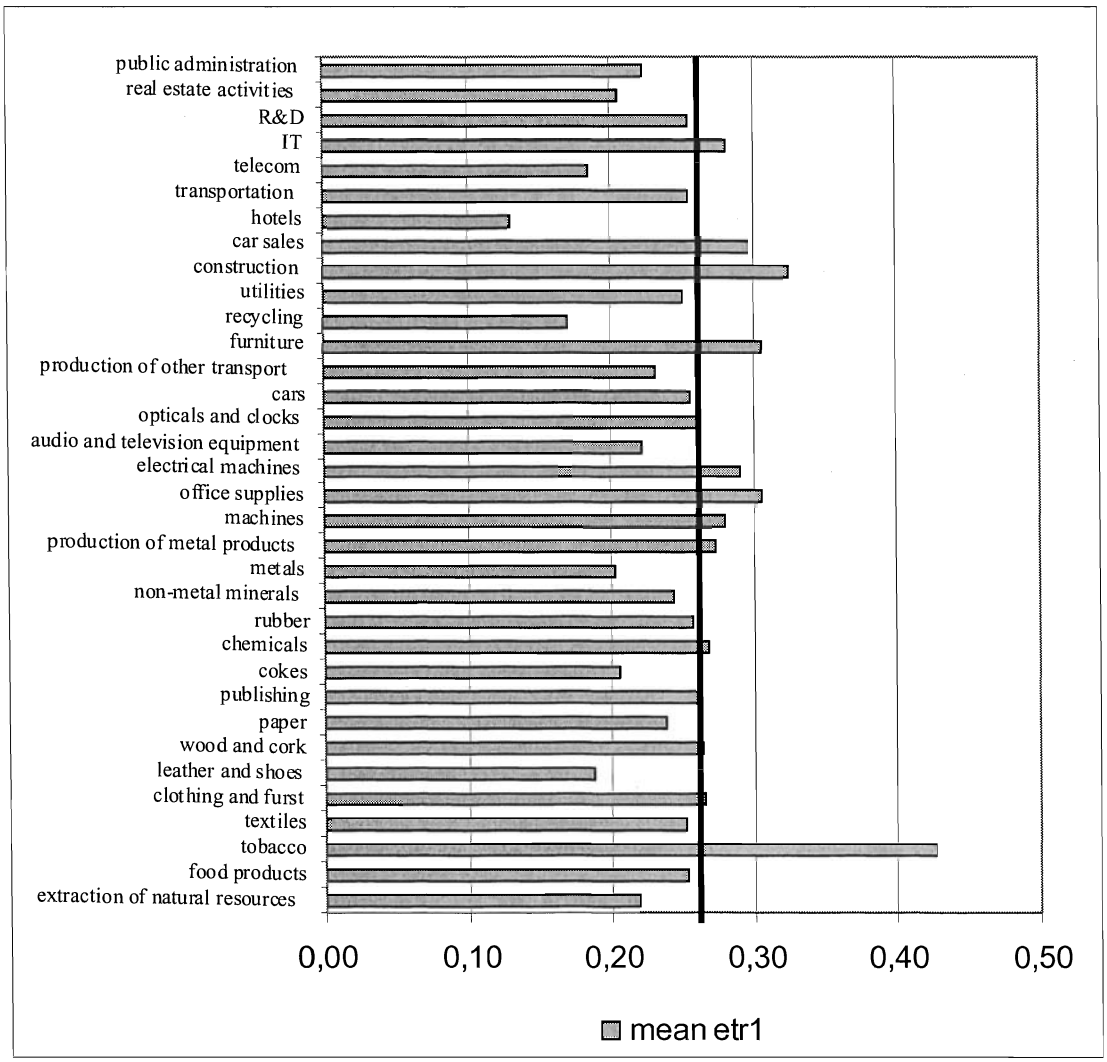
ETR1	Flanders	Wallonia	Brussels	Total
Mean	0.2699	0.2594	0.2402	0.2615
median	0.3239	0.2767	0.1579	0.2917
std. dev.	0.2537	0.2467	0.2583	0.2464
N° observations	58,816	15,406	21,546	95,768

[9] The Tax authority uses the unconsolidated accounts for determining the amount of corporate tax a firm has to pay (Plateau and Van Herck, 1996).

Also, on the basis of Table 1 we would be inclined to conclude that the average ETR in Wallonia and Brussels is somewhat lower than for Flanders. In the regression analysis in section 6, we will test for significant differences in ETRs between regions in a more formal way.

Figure 1 gives an overview of how the average ETRs per Nace-Bel 2-digit level sector.[10] The bold vertical line in Figure 1 represents the overall average ETR across sectors. It becomes clear that sectors like tourism (hotels), recycling and Research and Development (R&D) have below average Effective tax rates, while sectors like Tobacco has a higher than average rate.

Figure 1: Sector Heterogeneity in Effective Tax rates



[10] The complete list of names, Nace-Bel codes and observations per sector is in the Appendix Table A.1.

While in some cases the below average ETR may be a reflection of the legal tax facilities that firms in these sectors enjoy, like in the case of the R&D-and recycling-sector, it is far less easy to explain the average ETR level in others sectors. One potential explanation is that the government through the tax system is either encouraging or discouraging certain activities. Also, sectors in economic difficulty and subject to strong international competition like 'Metals' and 'Leather & shoes', seem to have lower ETRs. In the regression analysis in section 6 we will include 33 sector dummies to control for sector effects in addition to firm characteristics to explain the variation in firm level ETRs. [11]

5. The Model and Variable Definitions

The empirical model we introduce in this section closely follows the literature (Huizinga & Nicodème, 2003 and Buijinck et al., 2000) by including firm characteristics and sector dummies to explain firm level ETRs. In addition to this literature we also include year dummies, location dummies and legal tax facilities. The empirical specification we test has the following general form,

$$ETR_{it} = \beta_0 + \beta_1 FIRM\,SIZE_{it} + \beta_2 LEGAL_{it} + \beta_4 REGION_i + \beta_5 YEAR + \beta_6 SECTOR_i + \varepsilon_{it} \quad (1)$$

where the independent variable, ETR, is the effective tax rate of firm i in year t.
In the literature FIRM SIZE has predominantly been measured by the log of total assets but has resulted in ambiguous signs as argued by Gupta & Newberry (1997). For this reason we also proxy firm size by the log of total employment at the firm level (EMPLOYM). We further include a set of variables accounting for a number of legal tax breaks, such as capital intensity (CAP), Long term leverage (Ltleverage) and R&D expenses (R&Dintens). The capital intensity (CAP) of a company is defined as the ratio

[11]While there are 34, 2-digit NACE-BEL sectors, in the regressions we drop the 'Optical & Clockworks'-sector, because its ETR is exactly the average ETR across all sectors, which can be seen from Figure 1. The sector dummies therefore reflect a lower or higher ETR vis-à-vis the sector of 'Optical and Clockworks'.

of fixed tangible assets over total assets. This variable can affect ETR through the tax treatment of depreciation[12] or through the tax breaks for investments.[13] Long-term leverage is defined as the ratio of long-term debt over total assets. One reason for including this variable is that interest payments on debt are fully deductible as long as the creditor is a financial company institution (Vankerckhove and Heirewegh, 2003). As discussed above, there is also a tax facility for R&D investments and patents. This is the main reason for including the R&Dintens variable which is defined as the ratio of intangible fixed assets over total assets. [14]

To control for regional differences in ETRs we include two regional dummies. One with a value of 1 if a firm belongs to Brussels and a 0 otherwise and one with a value of 1 if a firm belongs to Wallonia and a zero otherwise (Flanders is the counterfactual). Another variable controlling for location is a dummy variable with a value of 1 if a firm belongs to a co-ordination center (COCEN).[15]

To analyze the yearly evolution of ETRs over the period we include 9 year dummies (y1994-y2002) with 1993 as the reference year. Finally to control for sector heterogeneity we include 33 sector dummies at two-digit Nace-Bel level. We also include an error term (ε_{it}) to control for white noise. In the next section we report the results of an Ordinary Least squares (OLS) regression where we take into account that firm observations in consecutive years are not independent observations. For this reason we cluster around firm observations. This renders the standard errors into robust standard errors. As a robustness check in section 7, we will use a fixed effects specification where we allow for a firm specific intercept. This implies that in expression (1), β_0 is replaced by β_i where subscript i refers to an individual firm. By including an intercept for each individual firm, we implicitly control for firms specific factors that are unobservable or not included in our analysis but that may affect the Effective tax rate and which is quite common to use in micro-econometrics using firm

[12] Depreciation is an expense of the period and lowers the tax base.

[13] For energy saving investments the company can deduct 13.5% of the purchase value of the investment from the taxable income (Vankerckhove and Heirewegh, 2003).

[14] We have also experimented with including the AGE of a firm, but this variable never turned out to be significant and was therefore dropped from the analysis.

[15] Co-ordination centers are locations where foreign multinational firms that engage in financial or business support services get a much lower tax rate.

level data. Examples of firm level fixed effects are the ability of the manager, the quality of the auditor, the political clout of a firm etc.

6. Empirical Results

In this section we discuss our main results. Table 4 reports the main OLS regression results for model (1), using all observations for the period 1993-2002. In column (1) we use the logarithm of total assets as size variable, while column (2) is the same regression but where we use the log of employment as a proxy for firm size.
Both firm size variables seem to have a positive effect on the ETR, indicating that larger firms pay higher taxes. This result has also been confirmed in other studies like Gupta & Newberry (1997) and Zimmerman (1983) for the US.

All the 'LEGAL' variables come with the expected sign. Highly leveraged firms with many interest expenses have lower ETRs, as well as firms that invest in R&D. Capital intensive firms have lower ETRs as a result of higher depreciations.
Also, we find evidence of regional tax competition. Both Brussels and the dummy for Wallonia are negative and significant, suggesting a lower average ETR in these regions than in Flanders. Note that this regional difference is obtained after controlling for sector composition and firm characteristics which may be different between the two regions. The results in Table 4 also confirm that Multinationals in co-ordination centers have a lower ETR.
The year-dummies we included are all positive and significant. This suggests that corporate tax burden has been rising since 1993. The coefficients indicate that the strongest increase has occurred in the most recent years. A possible explanation is that the tax base has widened gradually, to anticipate the large reduction in STR in December 2002 where Belgium reduced its STR to 33.99% from the fiscal year 2003 onwards.

Table 4: Regression Results

Dependent var	(1) etr1	(2) etr1	(3) etr2	(4) etr2	(5) etr2
Assets	0.003*	-	-0.002***	-	-0.001***
	[0.002]		[0.003]		[0.002]
Employm	-	0.016***	-	0.004	-
		[0.002]		[0.003]	
Ltleverage	-0.007***	-0.008**	-0.0006	-0.0005	1.25e-06*
	[0.002]	[0.004]	[0.0006]	[0.001]	[7.38e-07]
Cap	-0.05*	-0.05*	-0.007*	-0.006*	-2.7e-06*
	[0.027]	[0.028]	[0.004]	[0.004]	[1.62e-06]
R&Dintens	-0.24***	-0.249***	-0.023***	-0.022***	-4.13e-06
	[0.03]	[0.036]	[0.004]	[0.005]	[0.00]
Cocen	-0.123***	-0.148***	-0.006***	-0.016***	-0.008***
	[0.029]	[0.028]	[0.002]	[0.002]	[0.002]
Brussels	-0.017***	-0.019***	0.0002	0.001	-0.0001
	[0.007]	[0.008]	[0.001]	[0.001]	[0.001]
Wallonia	-0.015**	-0.017***	-0.003***	-0.003***	-0.003***
	[0.007]	[0.007]	[0.001]	[0.001]	[0.001]
Y1994	0.014***	0.017***	0.002***	0.002***	0.002***
	[0.006]	[0.006]	[0.001]	[0.001]	[0.001]
Y1995	0.014***	0.015***	0.003***	0.003***	0.003***
	[0.006]	[0.006]	[0.001]	[0.001]	[0.001]
Y1996	0.018***	0.02***	0.003***	0.002***	0.003***
	[0.006]	[0.006]	[0.001]	[0.001]	[0.001]
Y1997	0.02***	0.022***	0.004***	0.004***	0.004***
	[0.006]	[0.007]	[0.001]	[0.001]	[0.001]
Y1998	0.028***	0.028***	0.006***	0.006***	0.006***
	[0.006]	[0.007]	[0.001]	[0.001]	[0.001]
Y1999	0.037***	0.035***	0.007***	0.007***	0.007***
	[0.006]	[0.007]	[0.001]	[0.001]	[0.009]
Y2000	0.037***	0.034***	0.007***	0.007***	0.007***
	[0.007]	[0.007]	[0.007]	[0.001]	[0.009]
Y2001	0.038***	0.035***	0.007***	0.006***	0.006***
	[0.007]	[0.007]	[0.001]	[0.001]	[0.001]
Y2002	0.046***	0.042***	0.009***	0.007***	0.008***
	[0.007]	[0.007]	[0.001]	[0.001]	[0.001]
Extr. nat. resource	0.009	0.003	-0.001	-0.005	-0.002
	[0.036]	[0.04]	[0.005]	[0.004]	[0.005]
Food products	-0.026	-0.044*	-0.003	-0.007*	-0.004
	[0.025]	[0.026]	[0.004]	[0.004]	[0.004]
Tobacco	0.179***	0.16***	0.049*	0.045*	0.048*
	[0.026]	[0.026]	[0.025]	[0.025]	[0.025]
Textiles	-0.063**	-0.084***	-0.009**	-0.012***	-0.01***
	[0.03]	[0.031]	[0.004]	[0.004]	[0.004]
Clothing & furst	-0.023	-0.046	-0.003	-0.004	-0.003
	[0.043]	[0.046]	[0.008]	[0.009]	[0.008]
Leather & shoes	0.008	-0.008	-0.005	-0.009	-0.005
	[0.079]	[0.081]	[0.012]	[0.012]	[0.012]
Wood & cork	-0.023	-0.024	-0.016***	-0.017***	-0.015***
	[0.038]	[0.038]	[0.003]	[0.004]	[0.003]
Paper	-0.012	-0.039	-0.003	-0.007	-0.004
	[0.034]	[0.034]	[0.004]	[0.004]	[0.004]
Publishing	-0.011	-0.025	0.001	-0.001	0.001
	[0.027]	[0.028]	[0.004]	[0.005]	[0.004]
Cokes	-0.083	-0.111*	-0.004	-0.014***	-0.008
	[0.059]	[0.062]	[0.005]	[0.005]	[0.005]
Chemicals	-0.005	-0.022	0.005	-4.65e-06	0.003
	[0.026]	[0.027]	[0.004]	[0.004]	[0.004]
Rubber	-0.037	-0.058*	0.002	-0.001	0.001
	[0.028]	[0.029]	[0.005]	[0.005]	[0.005]
Non-metal prod.	-0.036	-0.052*	-0.002	-0.005	-0.003
	[0.028]	[0.029]	[0.004]	[0.004]	[0.004]
Metals	-0.094***	-0.114***	-0.008	-0.012***	-0.01***
	[0.032]	[0.034]	[0.004]	[0.004]	[0.004]
Prod. metal prod.	-0.017	-0.03	-0.002	-0.003	-0.002
	[0.027]	[0.028]	[0.004]	[0.004]	[0.004]
Machines	-0.009	-0.028	-0.001	-0.004	-0.001
	[0.027]	[0.028]	[0.004]	[0.004]	[0.004]
Office supplies	0.007	-0.016	-0.003	-0.006	-0.003
	[0.053]	[0.053]	[0.006]	[0.006]	[0.006]
Elec. machines	0.024	-0.001	0.005	0.002	0.005
	[0.033]	[0.034]	[0.005]	[0.005]	[0.005]
Audio & tv equip.	-0.062*	-0.089**	0.003	-0.001	0.002
	[0.036]	[0.039]	[0.006]	[0.007]	[0.007]

Cars	-0.021	-0.046	0.007	-0.004	-0.002
	[0.036]	[0.037]	[0.007]	[0.008]	[0.007]
Prod. ot. transport	-0.049	-0.08	-0.001	-0.007	-0.002
	[0.058]	[0.058]	[0.006]	[0.006]	[0.006]
Furniture	0.011	-0.01	-0.003	-0.005	-0.003
	[0.033]	[0.034]	[0.005]	[0.005]	[0.005]
Recycling	-0.129***	-0.127***	-0.008	-0.009	-0.009
	[0.041]	[0.041]	[0.007]	[0.007]	[0.007]
Elec. gas & water	-0.065	-0.078	-0.002	-0.009	-0.006
	[0.059]	[0.063]	[0.007]	[0.007]	[0.007]
Construction	0.057***	0.048*	-0.006*	-0.008*	-0.005
	[0.026]	[0.026]	[0.003]	[0.003]	[0.003]
Car sales	0.021	0.014	0.0001	-0.001	0.001
	[0.023]	[0.024]	[0.003]	[0.003]	[0.003]
Hotels	-0.12***	-0.141***	-0.01***	-0.013***	-0.012***
	[0.029]	[0.030]	[0.004]	[0.004]	[0.004]
Transportation	-0.02	-0.03	-0.008**	-0.01***	-0.008**
	[0.025]	[0.026]	[0.004]	[0.004]	[0.003]
Telecom	-0.096**	-0.101**	-0.003	-0.007	-0.007
	[0.046]	[0.048]	[0.008]	[0.008]	[0.007]
IT	-0.013	-0.022	0.004	0.004	0.005
	[0.028]	[0.029]	[0.005]	[0.005]	[0.005]
R&D	-0.119**	-0.141***	-0.015***	-0.018***	-0.017***
	[0.057]	[0.057]	[0.005]	[0.006]	[0.006]
Real estate	-0.039*	-0.018	-0.007**	-0.005	-0.007**
	[0.023]	[0.025]	[0.003]	[0.004]	[0.003]
Publ. admin.	-0.047*	-0.054*	-0.005	-0.006	-0.006
	[0.028]	[0.029]	[0.004]	[0.004]	[0.004]
Constant	0.228***	0.207***	0.039***	0.021***	0.029***
	[0.028]	[0.250]	[0.004]	[0.004]	[0.004]
Observations	27290	25683	27290	25683	27246
R^2	4.46%	4.88%	3.82%	2.82%	2.67%
F-statistic	13.55	14.28	9.69	8.10	8.46
Prob>F	0.00	0.00	0.00	0.00	0.00

note: standard errors are between brackets; *= significance level at 10%, **= significance level at 5%, ***= significance level at 1%

Some authors have used a different definition of the Effective Tax rate. Huizinga & Nicodème (2003) have used the ratio of 'Tax Expenses' over 'total Assets'. Columns 3 and 4 of Table 4 show the results of model (1) where the use this definition of ETR.

Most of our results are robust to the use of ETR2 as a dependent variable. However, the dummy for Brussels turns insignificant, while the dummy for Wallonia continues to be negative and strongly significant. In our view ETR2 is somewhat less suited to capture the extent of tax facilities, since there is no direct link between a firm's total assets and the tax rate it is subject to, which is why our preferred specification remains the ones with ETR1 as a dependent variable. Also the use of ETR2 can induce endogeneity problems as many right hand side variables of the model specification in (1) are also scaled by total assets. The appropriate way to address this is to use instruments, typically lagged by one year. Therefore we run one specification where we use lagged values of total assets in the denominator for the right hand side variables potentially causing the endogeneity (CAP, LTleverage, R&Dintens). The results are shown in column 5, but our main findings go through.

7. Robustness Check

Table 5 reports some robustness checks. We start in column (1) by reporting the outcome of a dynamic specification where we include the lagged value of ETR1 as an additional explanatory variable on the right hand side to control for potential autocorrelation. However, our main variables of interest namely the regional effects and the time effects remain intact. In column (2) of Table 5 we report the results of a censored tobit regression that takes into account that ETR1 is a truncated variable.[16]

Another common way to control for outliers is where we cut-off all ETR observations larger or smaller than twice the standard deviation of the mean ETR. The results of this regression are shown in column 3 of Table 5 but our results remain qualitatively the same.

In column (4) we control for carry-forwards of losses which applies under Belgian law, by including a variable (LOSS_1) to capture last year's losses. However, this variable is not significant in the regression and the other results go through.

The results of a fixed effects estimation is reported in column (5). Controlling for firm level fixed effects is very common in micro-econometrics. These fixed effects control for a number of unobservables at the firm level that may affect ETRs and that if not controlled for may introduce an omitted variables bias. The fixed effects estimation does not change the simple OLS results. All the firm level variables, regional and year effects continue to hold. We also experimented with a random effects model but the Hausman-test decided in favour of the fixed effects model as the most preferred specification. The variables capturing the regional tax competition in Belgium continue to be negative but the significance for Wallonia is stronger than for Brussels.

[16] The distribution of ETR1s is shown in Figure A.1 in the Appendix.

Table 5: Robustness Checks

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent var	etr1	etr1	etr1	etr1	etr1	Etr1
Etr1-1	0.545***	-	-	-	-	-
	[0.007]					
Employm	0.008***	0.033***	0.009***	0.016***	0.022***	0.015***
	[0.001]	[0.002]	[0.002]	[0.002]	[0.003]	[0.001]
Ltleverage	-0.004	-0.016***	-0.002***	-0.008**	-0.002	-0.008***
	[0.003]	[0.003]	[0.001]	[0.004]	[0.002]	[0.003]
Cap	-0.025*	-0.083***	-0.043*	-0.047*	-0.01*	-0.047*
	[0.015]	[0.006]	[0.024]	[0.028]	[0.005]	[0.027]
R&D	-0.145***	-0.451***	-0.27***	-0.254***	-0.118***	-0.25***
	[0.022]	[0.03]	[0.028]	[0.036]	[0.028]	[0.036]
Cocen	-0.074***	-0.11***	-0.115***	-0.148***	-	-0.147***
	[0.015]	[0.025]	[0.021]	[0.027]		[0.027]
Loss-1	-	-	-	-0.001	-	-
				[0.005]		
Brussels	-0.003	-0.011*	-0.02***	-0.004	-	-0.003
	[0.005]	[0.06]	[0.007]	[0.008]		[0.008]
Wallonia	-0.007*	-0.025***	-0.014*	-0.016**	-	-0.015***
	[0.004]	[0.006]	[0.007]	[0.007]		[0.007]
Y1994	0.035***	0.026***	0.016***	0.016***	0.021***	-
	[0.007]	[0.011]	[0.005]	[0.006]	[0.006]	
Y1995	0.027***	0.024**	0.021***	0.015***	0.016***	-
	[0.007]	[0.011]	[0.005]	[0.006]	[0.006]	
Y1996	0.032***	0.032***	0.028***	0.02***	0.023***	-
	[0.007]	[0.011]	[0.006]	[0.006]	[0.006]	
Y1997	0.031***	0.036***	0.028***	0.023***	0.024***	-
	[0.007]	[0.01]	[0.006]	[0.007]	[0.006]	
Y1998	0.033***	0.046***	0.040***	0.028***	0.022***	-
	[0.010]	[0.010]	[0.006]	[0.007]	[0.005]	
Y1999	0.042***	0.058***	0.042***	0.036***	0.025***	-
	[0.007]	[0.010]	[0.006]	[0.007]	[0.005]	
Y2000	0.036***	0.059***	0.042***	0.035***	0.021***	-
	[0.007]	[0.01]	[0.006]	[0.007]	[0.006]	
Y2001	0.038***	0.063***	0.042***	0.036***	0.019***	-
	[0.007]	[0.011]	[0.007]	[0.007]	[0.006]	
Y2002	0.036***	0.069***	0.042***	0.042***	0.02***	-
	[0.007]	[0.011]	[0.006]	[0.007]	[0.006]	
Gov2	-	-	-	-	-	0.013***
						[0.004]
Gov3	-	-	-	-	-	0.028***
						[0.005]
Sector-dummies	yes	yes	yes	yes	yes	Yes
Constant	0.074***	0.074***	0.175***	0.207***	0.156***	0.215***
	[0.015]	[0.019]	[0.022]	[0.025]	[0.012]	[0.024]
Observations	25683	26477	27162	25683	25683	25683
R^2	33.29%	6.01%	4.74%	4.88%	0.60%	4.8%
F-statistic	174.54		13.69	14.00	9.28	16.14

note: standard errors between brackets
*= significance level at 10%, **= significance level at 5%, ***= significance level at 1%

And as a final robustness check, we introduce a specification where we replace the year dummies by dummies for three distinct periods in Belgian politics. While both the periods '93-94 and '94-98 coincide with a federal coalition of Christian democrats and socialists, the last period '99-2002 coincides with a coalition of Liberal Democrats and

socialists. For each of these different governments we introduce a separate dummy labeled (Gov1, Gov2, Gov3) with a value of 1 for years in power, and zero otherwise. The last column in Table 5 shows the results of this specification where we dropped the first period dummy Gov1, hence the coefficients on the two other dummies are relative to the first period in our data. Both Gov2 and Gov3 are positive and significant, with the magnitude of the Gov3 variable twice the size of the Gov2 dummy. This implies that the Effective tax burden has increased most under the last legislation of Liberal Democrats and Socialists, probably in anticipation of the large reduction in STR from 2003 onwards.

8. Conclusion

This paper is the first to investigate the determinants of Effective Tax Rates (ETRs) for Belgium using company level data for the period 1993-2002. We found evidence of regional tax competition between the Northern region and the Southern region of the country, with lower average ETRs in Wallonia compared to Flanders. In addition, we found that Effective tax rates for large Belgian companies have steadily increased over the period 1993-2002. A potential explanation for this is that the government anticipated the large reduction in the statutory tax rate in December 2002, when the STR was reduced from 40.17% to 33.99%. By widening the tax base gradually the government may have ensured that the reduction in STR has had a lesser effect on the budgetary position.

Our data consisted of large Belgian firms all subject to the highest Statutory tax rate (STR) of 40.17%. However, the average Effective tax rates (ETR) which takes into account the tax base, lies substantially below that and for the more than 12,000 firms in our sample averages around 26%. Moreover, ETRs differ substantially between firms. Labour intensive firms pay relatively more taxes than capital intensive firms. Also, capital structure and R&D-intensity strongly reduce the Effective tax rates. In terms of sectoral differences, we find the 'socially desirable sectors' like tourism, recycling and R&D to pay relatively than less socially desirable sectors like for instance the 'Tobacco' sector.

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Appendix

Table A.1: Sectors, 2-digit level

Sector	Nace-Bel code	Observations
extraction of natural resources	10,11,12,13,14	1390
food products	15	4770
Tobacco	16	90
Textiles	17	2140
clothing and furst	18	540
leather and shoes	19	50
wood and cork	20	880
Paper	21	1020
Publishing	22	2480
Cokes	23	190
Chemicals	24	3180
Rubber	25	1840
non-metal minerals	26	2790
Metals	27	1160
production of metal products	28	3550
Machines	29	2660
office supplies	30	200
electrical machines	31	1140
audio and television equipment	32	470
opticals and clocks	33	470
Cars	34	790
production of other transport means	35	300
Furniture	36	1540
Recycling	37	500
Utilities	40,41	220
Construction	45	7480
car sales	50,51,52	37620
Hotels	55	1300
Transportation	60,61,62,63	9500
Telecom	64	370
IT	65,66,67,72	2280
R&D	73	130
real estate activities	70,71,74	24490
public administration	75,85,90,91,92,93,99	3100

Table A.2: Correlation Matrix

	ETR1	ETR2	ASSETS	EMPLOYMENT	LTleverage
Wallonia	-0.028	-0.034	-0.032	0.008	-0.003
Brussels	-0.02	0.002	0.044	-0.016	0.003
Cocen	-0.046	-0.038	0.156	-0.015	-0.002
R&Dintens	-0.078	-0.039	-0.095	-0.073	0.023
CAP	-0.098	-0.081	-0.001	0.014	0.060
LTleverage	-0.044	-0.023	-0.016	-0.029	1
EMPLOYM	0.082	0.017	0.653	1	-0.029
ASSETS	-0.015	-0.099	1	0.653	-0.016
ETR2	0.45	1	-0.015	0.017	0.017

	CAP	R&D	Cocen	Brussels
Wallonia	0.052	-0.008	-0.02	-0.274
Brussels	-0.054	0.082	0.036	1
Cocen	-0.044	-0.030	1	0.036
R&Dintens	-0.049	1	-0.030	0.082
CAP	1	-0.049	-0.044	-0.054

Table A.3: Data-Appendix

ETR1	Corporate tax expenses/ profit before taxes
ETR2	Corporate tax expenses/ total assets
BRUSSELS	=1 if in Brussels, =0 otherwise
WALLONIA	=1if in Wallonia, =0 otherwise
ASSETS	log(total assets)
EMPLOYM	log(employment)
CAP	tangible fixed assets/ total assets
LTLEVERAGE	total LT debt/ total assets
R&Dintens	Intangible fixed assets/ total assets
COCEN	=1 if coordination centre (Nace-Bel=74152), =0 otherwise
SECTORS	33 sector dummies at 2- digits Nace-Bel (=0 if optical and clocks sector)
Y1994 - Y2002	9 Year dummies (=0 if 1993)

Figure A.1: Kernel Density Estimates of ETR1